

REMARKS

The Final Office Action mailed on April 8, 2003, has been received and reviewed.

Claims 1-5, 11-17, 25-28, and 33-38 are currently pending and under consideration in the above-referenced application. Each of claims 1-5, 11-17, 25-28, and 33-38 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 102(e)

Tsai

Claims 1-4, 11-14, 16, 25-27, 33-35, and 37 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 5,712,185 to Tsai et al. (hereinafter "Tsai").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Tsai describes a method for forming shallow trench isolation structures in a semiconductor substrate. The method of Tsai includes providing a substrate 30 that includes a silicon oxide layer, which is referred to as "pad oxide layer 32," thereover and a silicon nitride layer 34 over the pad oxide layer 32. FIG. 3A. A sacrificial layer 36 of either polysilicon or silicon oxide is formed over the silicon nitride layer 34. FIG. 3B. A photomask 37 with apertures for defining trenches in the semiconductor substrate 30 is then formed over the sacrificial layer 36. FIG. 3C. Next, the trenches 38 are formed through each of layers 36, 34, and 32 and in the semiconductor substrate 30. FIG. 3D.

The photomask 37 is then removed and the silicon nitride layer 34A descummed, or etched laterally beneath the overlying sacrificial layer 36A. FIG. 3E. A thin oxide layer 39 is then formed on the surfaces of the semiconductor substrate 30 that are exposed within the trench 38A. FIG. 3F. The trench 38A is filled with a suitable dielectric material, which is referred to as "isolation material 40," such as tetraethylorthosilicate (TEOS), which also fills the descummed regions of the silicon nitride layer 34B and forms a dielectric layer over the sacrificial layer 36A. FIG. 3G. The dielectric layer and sacrificial layer 36A are then removed to expose the surface of

the silicon nitride layer 34B and to form an isolation region 40A from the isolation material.

FIG. 3H. Upon removal of the silicon nitride layer 34B, regions of the dielectric material that filled the descummed portion of the silicon nitride layer 34B extend laterally beyond the outer periphery of the trench 38A and over portions of the pad oxide layer 32A. FIG. 3I. Exposed portions of the pad oxide layer 32A are then removed from the surface of the semiconductor substrate 30, leaving only the isolation region 40A and portions of the pad oxide layer 32B that are shielded thereby. FIG. 3J.

By way of contrast with the method disclosed in Tsai, each of independent claims 1, 11, 25, and 33 recites a method of forming an isolation structure. In each of these methods, a layer of isolation material is applied “over [a] buffer film layer, [with] major surfaces of [the] layer of isolation material and [the] buffer film layer in contact . . .”

The third edition of the American Heritage College Dictionary defines “major” as “great in scope or effect.” The definition for “major” that has been cited by the Office is similar, “notable or conspicuous in effect or scope.” It appears, however, that the Office has not considered the magnitude identified by the terms “notable” and “conspicuous.” “Notable” is defined by the third edition of the American Heritage College Dictionary as meaning “[w]orth of note or notice; remarkable . . .,” as well as “[c]haracterized by excellence or distinction . . .” That dictionary defines the term “conspicuous” as “[e]asy to notice; obvious . . .”

It is respectfully submitted that the 1,000 Å (0.1 µm) to 5,000 Å (0.5 µm) edge of the silicon nitride layer 34 of Tsai is not “major,” “great,” “notable,” or “conspicuous” in scope relative to the distance (typically several microns) across the area between adjacent isolation regions and, thus, the dimensions across the upper and lower *surfaces* thereof. As such, one of ordinary skill in the art would readily recognize that the term “major surface” does not apply to the extremely thin edges of the silicon nitride layer 34 but, rather, to the *surfaces* (*i.e.*, upper and lower surfaces) thereof.

FIG. 3G of Tsai clearly illustrates that a major surface of the isolation material 40, when applied, contacts a major surface of the sacrificial layer 36A, which is formed from either polysilicon or silicon oxide. Col. 2, line 59, to col. 3, line 2. Thus, Tsai does not expressly or inherently describe that the major surface of the isolation material 40 contacts the major surface of the silicon nitride layer 34, as required by each of independent claims 1, 11, 25, and 33.

Therefore, Tsai does not anticipate any of independent claims 1, 11, 25, or 33 under 35 U.S.C. § 102(e). Accordingly, under 35 U.S.C. § 102(e), each of independent claims 1, 11, 25, and 33 is allowable over Tsai.

Claims 2-4 are each allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Each of claims 12-14 and 16 is allowable, among other reasons, as depending either directly or indirectly from claim 11, which is allowable.

Claims 26 and 27 are both allowable, among other reasons, as respectively depending directly and indirectly from claim 25, which is allowable.

Claims 34, 35, and 37 are each allowable, among other reasons, as depending either directly or indirectly from claim 33, which is allowable.

In view of the foregoing, it is respectfully requested that the 35 U.S.C. § 102(e) rejections of claims 1-4, 11-14, 16, 25-27, 33-35, and 37 be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Tsai

Claims 17 and 38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of the Examiner's Comment.

Claim 17 is allowable, among other reasons, as depending from claim 11, which is allowable.

Claim 38 is allowable, among other reasons, as depending from claim 33, which is allowable.

Tsai in View of Lee

Claims 5, 15, 28, and 36 each stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of Lee HS, et al., "An Optimized Densification of the Filled Oxide for Quarter Micron Shallow Trench Isolation (STI)," 1996 IEEE Symposium on VLSI Technol. Dig. of Technical Papers, pages 158-59 (hereinafter "Lee").

Claims 5, 15, 28, and 36 are each allowable, among other reasons, as depending from claims 1, 11, 25, and 33, respectively, each of which is allowable.

For these reasons, it is respectfully requested that the 35 U.S.C. § 103(a) rejections of claims 5, 15, 17, 28, 36, and 38 be withdrawn.

CONCLUSION

It is respectfully submitted that each of claims 1-5, 11-17, 25-28, and 33-38 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



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